CLAIMS

1. Indicator lamp (10), in particular for a motor vehicle, comprising an optical axis (A-A) oriented from the rear to the front, on which there is a light source (14) which is provided for emitting a light flux towards the front, at a solid angle centred on the axis (A-A), and of the type comprising an optical device (12) for recovering and distributing the rays of light emitted by the source, with a view to providing, towards the front, an indicating function that meets the regulations, the optical device (12) comprising a coaxial annular reflector (20) and, in front of the light source (14), a central optical part known as the light engine (22) which is provided for distributing the rays of light emitted by the source (14) in directions that are generally transverse about the optical axis (A-A), towards the coaxial annular reflector (20) that is provided for distributing the rays of light, coming from the light engine (22), towards the front, generally in a direction parallel to the optical axis (A-A), so as to provide the indicating function that meets the regulations, said indicator lamp (10) being characterized in that the light engine (22) is made of a transparent material having a refractive index greater than that of air, and in that the light engine (22) comprises:

- an inlet face (24) which is arranged axially opposite the light source (14) and the profile of which, in axial section, is such that most of the rays of light emitted by the source (14) penetrate into the light engine (22);

- an outlet face (34, 104) which is arranged generally radially opposite at least one axial section of the coaxial annular reflector (20);

- at least one front inner reflection face (32) which is provided to deflect, according to the principle of total reflection, at least part of the rays of light that enter the light engine (22), towards the outlet face (34, 104), such that the rays of light leave the light engine (22) by way of the outlet face (34, 104) by being refracted, and such that these rays of light strike the coaxial annular reflector (20) at given angles of incidence.

2. Indicator lamp (10) according to the preceding claim, characterized in that the light engine (22) comprises a rear inner reflection face (30, 104) of concave parabolic annular shape, which is focused on the light source (14) and which reflects the rays of light axially towards the front.

3. Indicator lamp (10) according to the preceding claim, characterized in that the light engine (22) comprises a front inner reflection face (40) of convex parabolic annular shape, which is arranged axially opposite the rear reflection face (30) and which is designed to cause the reflection of the rays of light, reflected by the rear reflection face (30), in a given direction towards an associated section (44) of the outlet face (34).

4. Indicator lamp (10) according to the preceding claim, characterized in that the section (44) of the outlet face (34) that is associated with the parabolic front reflection face (40) has a convex hemispherical annular shape, which

is centred on the focus (F2) of the associated parabola such that the rays of light reflected by the parabolic front reflection face (40) pass through the outlet face (34) in a substantially orthogonal manner.

5. Indicator lamp (10) according to any one of the preceding claims, characterized in that the light engine (22) comprises a conical or frustoconical front reflection face (36) which is centred on the optical axis (A-A) such that the axial rays of light, which are reflected by the conical front face (36), strike the outlet face (34) at an angle of incidence that is determined by the value of the angle at the vertex (α) of the conical face (36).

6. Indicator lamp (10) according to the preceding claim, characterized in that the angle at the vertex (α) of the conical face (36) is substantially equal to ninety degrees, and in that the portion (38) of the outlet face (34) that is arranged radially opposite the conical face (36) is substantially cylindrical, so that the rays of light reflected by the conical face (36) pass through the outlet face (34) in a substantially radial direction.

7. Indicator lamp (10) according to any one of Claims 3 to 6, characterized in that at least one axial section (76) of a front reflection face (32) is obtained by anamorphosis, with a view to producing a spatial distribution of the rays of light transmitted towards the reflector (20) which is adapted to provide a given indicating function, for example a fog-lamp function.

8. Indicator lamp (10) according to any one of Claims 1 to 7, characterized in that the light engine (22) comprises a peripheral annular portion (46) which extends transversely outwards and which comprises a front outlet face (48) provided with coaxial circular ridges (50) along the optical axis (A-A), the ridges (50) forming diopters designed to refract, axially towards the front, the rays of light coming from the inlet face (24).

9. Indicator lamp (10) according to Claim 2, characterized in that the light engine (22) comprises a front reflection face (32) which is provided with catadioptric patterns (110) that are designed to reflect, according to the principle of total reflection, the rays of light coming from the rear reflection face (104), towards the outlet face (104) in a direction that is substantially orthogonal to the outlet face (104).

10. Indicator lamp (10) according to the preceding claim, characterized in that the outlet face (104) is at least partly coincident with the rear reflection face (104).

11. Indicator lamp (10) according to Claim 9 or 10, characterized in that each catadioptric pattern (110) comprises two inclined faces (118, 120) which between them form an angle (β) of given value, said faces (118, 120) being arranged with respect to the optical axis (A-A) such that each ray parallel to the optical axis (A-A) that strikes a catadioptric pattern (110) is reflected on one of the two faces (118, 120) and then on the opposite face,

according to the principle of total reflection, before being transmitted towards the outlet face (104).

12. Indicator lamp (10) according to the preceding claim, characterized in that each catadioptric pattern (110) is truncated in the vicinity of the vertex of the angle (β) formed by the two inclined faces (118, 120), such that part of the rays of light that strike the catadioptric pattern (110) are refracted towards the front, through the truncation (122).

13. Indicator lamp (10) according to any one of Claims 1 to 12, characterized in that the front reflection face (32) has a coaxial annular shape, and in that the light engine (22) comprises a front central outlet face (85, 106), adjacent to the front reflection face (32), which is provided to refract the rays of light, coming from the light source (14), directly towards the front.

14. Indicator lamp (10) according to the preceding claim, characterized in that the front central outlet face (106) comprises a series of elementary dioptric distribution elements (108) which are provided so as to each form, from the rays of light passing through them, an elementary light beam that is directed towards the front.

15. Indicator lamp (10) according to any one of Claims 1 to 14, characterized in that the inlet face (24) of the light engine (22) comprises a concave hemispherical portion (28) which is centred on the light source (14).

16. Indicator lamp (10) according to any one of Claims 1 to 14, characterized in that the inlet face (24) comprises a central portion (26) that forms a collimator, so as to refract the rays of light axially towards the front.

17. Indicator lamp (10) according to Claim 1, characterized in that the light engine (22) is made of a transparent material having a refractive index greater than that of air, and in that the light engine (22) comprises:

- a generally hemispherical inlet face (24, 148) which is centred on the light source (14) and which comprises coaxial annular echelons (150) provided for deflecting the rays of light by means of refraction;
- an outlet face (134) which is arranged generally radially opposite at least one axial section of the coaxial annular reflector (20);

such that the rays of light leave the light engine (22) by way of the outlet face (134) by being refracted, and such that these rays of light strike the coaxial annular reflector (20) at given angles of incidence.

18. Indicator lamp (10) according to the preceding claim, characterized in that the outlet face (134) of the light engine (22) has a generally hemispherical shape centred on the source (14).

19. Indicator lamp (10) according to Claim 17 or 18, characterized in that the light engine comprises a light diffusion face (132) which is arranged axially opposite a central zone (136) of the inlet face (24), so as to distribute, generally axially towards the front, part (R4) of the rays of light emitted by the source (14).

20. Indicator lamp (10) according to any one of Claims 1 to 16, taken in combination with Claim 4 or 6, characterized in that the front face (62) of the coaxial annular reflector (20) is reflective, and in that the front face (62) comprises at least one axial section (88, 90) that is parallel to an associated axial section (36, 40) of the front reflection face (32) of the light engine (22).

21. Indicator lamp (10) according to any one of Claims 1 to 19, characterized in that the front face (62) of the reflector (20) is reflective, and in that the front face (62) comprises a series of elementary reflection facets (124) that are oriented, with respect to the angle of incidence of the rays of light coming from the light engine (22), so as to reflect the rays of light, generally axially towards the front, thereby each forming an elementary light beam, the image of which, on a screen placed in front of the indicator lamp (10), corresponds to the indicating function to be provided.

22. Indicator lamp (10) according to the preceding claim, characterized in that the front face (62) of the reflector (20) is echeloned axially towards the front and transversely outwards.

23. Indicator lamp (10) according to any one of Claims 1 to 19, characterized in that:

- the coaxial annular reflector (20) is made of a transparent material having a refractive index greater than that of air;

- the profile of the front face (62) of the reflector (20), with respect to the angle of incidence of the rays of light coming from the light engine (22), is such that said rays of light are refracted inside the reflector (20) when they strike the front face (62) of the reflector (20);

- the rear face (56) of the reflector (20) is designed to reflect said rays of light towards the front, such that they are refracted through the front face (62) in a generally axial direction.

24. Indicator lamp (10) according to the preceding claim, characterized in that the rear face (56) of the reflector (20) comprises a reflective coating.

25. Indicator lamp (10) according to the preceding claim, characterized in that the rear face (56) of the reflector comprises a series of elementary reflection facets (126) that are oriented in a given manner, with respect to the angle of incidence of the rays of light that are refracted inside the reflector (20) through the front face (62).

26. Indicator lamp (10) according to Claim 23, taken in combination with Claim 4 or 6, characterized in that the front face (62) of the reflector (20) comprises generally axial portions (68, 72), which are arranged substantially orthogonally with respect to the direction of the rays of light coming from the light engine (22), and generally radial portions (70, 74), which are located between two axial portions (68, 72), and in that the rear face (56) of the reflector (20) comprises axial sections (58, 60) that are substantially parallel to the associated sections (38, 44) of the front reflection face (32) of the light engine

(22), such that the rays of light coming from the light engine (22):

- are refracted through the axial portions (68, 72) towards the inside of the reflector (20), without being deflected,

- then are reflected, axially towards the front, on the rear face (56) of the reflector (20),

- then are refracted through the radial portions (70, 74), towards the outside of the reflector (20), generally axially towards the front.

27. Indicator lamp (10) according to Claim 23, characterized in that the rear face (56) of the reflector (20) comprises a series of catadioptric patterns (130) having two faces, such that the rays of light coming from the light engine (22):

- are refracted through the front face (62) of the reflector (20), towards the inside of the reflector (20),

- then are reflected twice on a catadioptric pattern (130) so as to be directed towards the front,

- then are refracted through the front face (62) of the reflector (20), towards the outside of the reflector (20), generally axially towards the front.

28. Indicator lamp (10) according to Claim 26 or 27, characterized in that the front face (62) of the reflector (20) comprises a series of elementary dioptric distribution elements (128) which are designed to refract the rays of light, coming from the rear face (56) of the reflector (20), thereby forming elementary light beams directed towards the front, the image of which, on a screen placed

in front of the indicator lamp (10), corresponds to the indicating function to be provided.

29. Indicator lamp (10) according to any one of the preceding claims, characterized in that the light engine (22) is integrated in the device (14) forming the light source.